REMARKS

In the above reference case, Claims 21-40 are pending. Applicants thank for the Examiner's thorough examination of the pending claims and thoughtful comments. Applicants will sequentially address the issues raised by the Examiner.

I. Telephone Interview (8/21/2007 and 8/22/2007) Summary

Telephone interviews were held on August 21 and August 22, 2007 between the Examiner and the undersigned (Roger H, Chu, Applicants' representative). Also participated in the first interview are Applicants, William Feng, Paul DuBois and John Hallquist. The Examiner is thanked for taking the time from his busy schedule to discuss the claims and the present OA.

During the first interview, distinct features of the invention in the instant application were explained by Applicants. In the second interview, proposed claim amendments were discussed between the Examiner and the undersigned. Although there was no definitive agreement reached, the Examiner indicated that the discussed amendments to the independent claims may lead to allowance pending addition search.

II. Specification Objections

Informalities in the Specification pointed out by the Examiner have been addressed and amended in the foregoing AMENDMENTS to the Specification section. Applicants respectfully request that the objections to the Specification be withdrawn.

III. Drawings Objections

Applicants have adopted the suggestion from the Examiner to amend FIG. 1. Therefore, withdrawal of the objections to the drawings is respectfully requested.

IV. Claim Objections

Term '[material] coefficients μ and α' in claims 21, 31 and 36 stands objections as being possible indefiniteness.

Claims 21, 31 and 36 have been amended in this response. As a result, the possibility of indefiniteness has been removed. Therefore, Applicants respectfully request that the objections to claims 21, 31 and 36 be withdrawn.

V. The 35 U.S.C. §112 Rejections (First Paragraph)

Claims 21-40 stand rejected under 35 U.S.C. §112 first paragraph for allegedly being failed to comply with the enablement requirement. Applicants disagree.

Claims 21, 31 and 36 as presently amended recite, *inter alia*, "calculating a plurality of stress function f(λ) values with each value at a particular stretch ratio λ of interest, .." (*Emphasis added*). The Examiner may be confused with the relationship between "a plurality of stress function f(λ) values" and the equation 340 of FIG. 3. The plurality of stress function f(λ) values is selected by user to represent a range of λ of interest (e.g., the range between ε_{0c} and ε_{0t} as shown in FIG. 4). Depending upon simulations, different number of stress function f(λ) values may be selected by dividing up the range of interest into a desired number of segments with each segment represented by one of the plurality of stress function values. Those of ordinary skilled in the art of simulating structural responses using finite

element analysis (e.g., engineers or scientists having a post graduate degree in Mechanical Engineering) would know what number to use for dividing up the range to achieve a successful and realistic simulation for predicting the structural responses of a structure containing compressible material such as foam.

Further, regarding Equation 340 is used for calculating the plurality of stress function f(λ) values with each value at a particular stretch ratio λ of interest. In the OA, the Examiner stated that "[a]n infinite series, by definition, is unbounded. .." While it is true that Equation 340 contains an infinite series, but that does not necessarily mean the equation cannot be computed or evaluated. Indeed, an exemplary procedure for evaluating Equation 340 is presented in FIG. 5 and corresponding descriptions in paragraph [0059]. One ordinary skill in the art would know how to evaluate Equation 340, especially for an infinite series that converges very fast as indicated in the Specification: "[b]ecause the order of magnitude decreases drastically from one term to the next, the sequence converges very rapidly." Paragraph [0059] Specification

Therefore, Applicants submit that the 35 U.S.C. §112 rejections (First Paragraph) was made erroneously by the Examiner. Withdrawal of the rejections is respectfully requested.

VI. The 35 U.S.C. §112 Rejections (Second Paragraph)

Claims 21-40 stand rejected under 35 U.S.C. § 112 second paragraph for allegedly being indefinite for failing to point out and distinctly claim the subject matter which applicant regards as the invention. Applicants disagree.

Independent claims 21, 31 and 36 as presently amended recite, *inter alia*, "evaluating element stresses, representing structural responses, in a

local coordinate system from the lookup table in accordance with a set of principal stretches at each integration point of each of the finite elements in the finite element analysis of a structure including the compressible material". In the art of simulating structural responses using finite element analysis, the element stresses obtained in a finite element analysis are the responses of a structural product (e.g., a car, an airplane, etc.).

Since evaluating element stresses is equivalent to simulate structural responses, Applicant respectfully request that the 35 U.S.C. §112 Rejections (Second Paragraph) be withdrawn for independent claims and for all of the dependent claims that are directly or indirectly dependent upon the independent claims 21, 31 and 36.

VII. The 35 U.S.C. §101 Rejections

Claims 21-40 stand rejected under 35 U.S.C. §101 as allegedly being directed to non-statutory subject matter for not producing a useful, concrete and tangible result. Applicants disagree.

Simulating structural response of a compressible material (e.g., an automobile's bumper) is useful in designing a car to meet certain industry standards and government regulations. Claims 21, 31 and 36 as presently amended recite, *inter alia*, "evaluating element stresses, representing structural responses, in a local coordinate system from the lookup table in accordance with a set of principal stretches at each integration point of each of the finite elements in the finite element analysis of a structure including the compressible material", which allows those of ordinary skilled in the art of simulating structural response using finite element analysis to simulate or predict the structural responses of a structure containing compressible material. This clearly shows a tangible result to be used in the real world (e.g., design a car, an airplane, a motorcycle, etc.).

Thus, Applicants respectfully request that the 35 U.S.C. §101 rejections be withdrawn for independent claims 21, 31 and 36 and for all of the dependent claims that are directly or indirectly dependent upon the independent claims.

VIII. The 35 U.S.C. §103 Rejections

Claims 21-27, 29, 31-34 and 36-39 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over MSC Technical Paper, MSC Software, "Nonlinear FEA of elastomers" (hereinafter "MSC") in view of Gallagher et al., "An efficient 3-D visualization technique for finite element models and other coarse volumes" (hereinafter "Gallagher'). Claims 28, 30, 35 and 40 were rejected 35 U.S.C. §103(a) as allegedly being unpatentable over MSC in view of Gallagher and further in view of Peric et al., "Finite-Element applications to the non-linear mechanics of solids" (hereinafter "Peric"). Applicants respectfully traverse the rejections.

A. Independent Claim 21

It is axiomatic that the combination of cited references in a §103 rejection must disclose every element in the rejected claim. MPEP 2143.03. Claim 21 is amended in the forgoing amendment to further distinguish from the cited reference. As presently amended, Claim 21 recites:

calculating a plurality of stress function f(λ) values with each value at a particular stretch ratio λ of interest, independent of curve fitting determination of material constants of Ogden strain energy function, wherein each of the plurality of stress function values equals to summation of a sequence of $\lambda^{[-\upsilon]^j}\ \sigma_0\left(\lambda^{[-\upsilon]^j}\right)$, where j is an integer

related to j-th term of the sequence, ν is Poisson's ratio of the compressible material, and $\sigma_0\left(\lambda^{[-\upsilon]^j}\right)$ is the stress value at $\lambda^{(-\upsilon)^j}$ defined by the stain-stress curve for the compressible material; (*Emphasis added*)

The presently amended limitation is supported in equation 340 in FIG. 3 and corresponding descriptions in paragraph [0057] of the Specification as follows: "Using the relationship between strain ε and stretch ratio λ in **330**, the equation **320** transforms to equation **340**, which can be evaluated solely with the stress values corresponding to the strains from the strain-stress curve obtained via a uniaxial tension/compression test of the material of interest. Finally, the nominal stress σ_0 and true stresses σ are rewritten and dependent only on the stress function f(λ) listed in formulas **350** and **360**, respectively." It is clearly indicated that the plurality of stress function f(λ) values is directly calculated from the strain-stress curve obtained in a uni-axial test. For example, each term in each of the stress function values depends on two quantities: stretch ratio λ (i.e., strain ε minus 1) and corresponding stress σ from the strain-stress curve. In particular, terms $\lambda^{[-\upsilon]^j}$ and $\sigma_0\left(\lambda^{[-\upsilon]^j}\right)$ in equation 340 represents a particular stretch ratio and corresponding stress, respectively. Therefore, the invention as claimed in the instant application is totally independent from all prior art approaches. The prior approaches require lengthy trial-and-error curve fitting to determination of material constants of Ogden strain energy function (i.e., equation 110 of FIG. 1). As indicated in the paragraph [0009] of the Specification, the problem solved by the present invention is to avoid "[t]o implement Ogden strain energy function properly in the FEA software requires engineers to spend a tremendous amount of

time …. Into a set of coefficients to fit a polynomial Ogden function .." and to avoid ".. [the] lengthy iterative trial-and-error process ..".

In contrast, MSC teaches the exact problem that the present invention was invented to solve. MSC discloses the Ogden strain energy function (column 3, page 7 to column 1, page 8). While MSC suggests some values to be used for foam-like materials (column 1, page 8), MSC admits that " determining the material constants .. follow from the least squares method … However, the material constants may turn out to be negative and therefore physically not meaningful." (*Emphasis added*) This means that the curve fitting determination of material constants of the Ogden strain energy function is not easy requiring a lengthy effort. In the current Office Action, the Examiner relied on the following disclosure in MSC: "Automated facilities are available to help user determine these material parameters from the test data. The curve-fitting program is iterative and consists of four steps: (1) data entry – where the user inputs experiment data; (2) evaluation – where the [curve-fitting] program mathematically fits the [experiment] data; (3) …." (*Emphasis added*) to make the 103 rejection. It is clear that step (2) of MSC teaches the prior art approach of curve-fitting determination of material constants of the Ogden strain energy function.

Furthermore, MSC is a paper produced by a software vendor - MSC Software Corporation. The objective of the MSC paper is to promote one of the MSC products. Applicants respectfully submit that MSC overly simply the tedious procedure of determining material constants in the Ogden strain energy function as evident in page 21 of MSC. In reality, the curve-fitting determination of coefficients (i.e., material constants) of a polynomial function such as Ogden strain energy function is a huge challenge. Because the determination of

material constants of a polynomial function is an ill-conditioned mathematical problem including multiple roots or solutions, it is unlikely for one ordinary skilled in the art to determine a set of material constants that fit the experiment data easily. Many of the solutions or roots of the Ogden strain energy equation are physically meaningless, which is admitted by MSC (page 21, column 2). Because of highly non-linear behavior of the mathematical problem, a lengthy iterative trial-and-error process is almost always required to determine material constants in Ogden strain energy function.

Applicants submit that none of the cited references teaches, discloses nor suggests the new limitation: "independent of curve fitting determination of material constants of Ogden strain energy function" recited in claim 21.

Based on the above remarks, Applicants believe the currently amended Claim 21 shall be allowable over the cited references. Reconsideration of Claim 21 is respectfully requested.

B. Independent Claims 31 and 36

Independent claims 31 and 36 incorporate similar features recited in claim 21 and were also rejected for the similar alleged reasons as for Claim 21. Applicants would like to apply the above remarks for Claim 21 to support Claims 31 and 36 also. Reconsideration of Claims 31 and 36 is respectfully requested

C. Dependent Claims

Dependent claims 22-30 are dependent upon claim 21, claims 32-35 are dependent upon claim 31, claims 37-40 are dependent upon

claim 36, and contain additional limitations further distinguishing them from MSC, Gallagher or Peric, viewed alone or in combination. Therefore, claims 22-30, 32-35 and 37-40 shall be allowable for at least the reasons stated above with regard to independent claim 21.

IX. Conclusion

Overall, none of the references singly or in any motivated combination disclose, teach, or suggest what is recited in the independent claims. Thus, given the above amendment and accompanying remarks, the independent claims are now in condition for allowance. The dependent claims that depend directly or indirectly on these independent claims are likewise allowable based on at least the same reasons and based on the recitations contained in each dependent claim.

If the undersigned has overlooked a teaching in any of the cited references that is relevant to the allowability of the claims, the Examiner is requested to specifically point out where such teaching may be found. Further, if there are any informalities or questions that can be addressed via telephone, the Examiner is encouraged to contact the undersigned at (408) 255-6853.

The fee for two-month extension of time has been paid when submitting this response via the Office electronic filing system (EFS). No additional fee is required for this amendment, if it is determined that a fee is due in connection with this paper, the Commissioner is authorized to charge such payment or fees associated with this communication, or credit any overpayment, to Deposit Account No. 553308.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,

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I hereby certify that this correspondence is being transmitted to the Commissioner for Patents via the Office electronic filing system on the date stated below.

Date: Sept. 6, 2007

Signature: /Roger H. Chu, Reg.# 52745/
Roger H. Chu